53. A COMPARATIVE ECO-ANATOMICAL STUDY ON THE RHIZOME OF THREE INDIAN MARSILEAS

(With one plate)

A study was conducted on the variations in the Rhizomes of the three Indian species of *Marsilea* L. namely, *Marsilea coromandeliana* Willd., *Marsilea kedarmalii* (Bhardwaja *et al.* 1994) and *Marsilea shashibalii* (Bhardwaja *et al.* 2000). *Marsilea coromandeliana* Willd. and *M. kedarmalii* Bhardwaja *et al.* were collected from the southern states of Kerala and Tamil Nadu respectively. *M. shashibalii* Bhardwaja *et al.* was collected from Kota district, Rajasthan and studied to investigate the eco-anatomical variations present among the three species.

Genus *Marsilea* L., well known for its amphibious nature, flourishes with equal ease in aquatic as well as in strongly xeric habitats (Bhardwaja 1966). It is, therefore, possible to categorise its various species as xeromorphic, amphibious or hydromorphic forms. Anatomical studies of ferns and fern allies, with special reference to stelar system, have been extensively investigated during the last century. Pande (1923) reported the presence of dictyostele in the tubers of *Marsilea erosa* L. and oil as the storage product in its cortex. But a critical study of this genus with special reference to land and water forms has not been made so far.

Land and water forms of all the three species were cultivated in the botanical garden of the Government College, Ajmer, Rajasthan. Different cultural practices were followed for land and water forms (D'Souza *et al.* 1993). Land forms were raised in pots, and given a measured quantity of water on alternate days. Water forms were raised in pots placed under water in a tank.

Hand and microtome sections of the rhizome were taken using the Tertiary Butyl Alcohol (TBA) Method for dehydration followed by paraffin embedding. 10-15 mm thick sections were stained using Safranine–Fast Green and mounted in DPX.

The study shows that there are a number of significant anatomical variations in the land and water forms of the three species of *Marsilea*.

The epidermis is thin-walled in the water forms, whereas it is thick in the land forms. Among the three species, *M. shashibalii* Bhardwaja *et al.* has the thickest epidermal wall. The inner cortex is parenchymatous in the water forms, whereas it is sclerenchymatous in the land forms. All the water forms have abundant aerenchyma in the outer cortex, compared to the land forms. In the land form of *M. shashibalii* Bhardwaja *et al.*, aerenchyma is nearly absent. The inner cortical cells of the land forms contained starch grains. These were abundant in the land form of *M. coromandeliana* Willd., but absent in the water forms of all the three species.

The stelar perimeter of the rhizome in the land forms is comparatively larger than that of water forms. The lignification of xylem elements reveals differences in land and water forms. The land forms having thicker lignin deposition, while water forms have poor lignification of tracheides. The pith in land forms is highly sclerotic, particularly in *M. coromandeliana* Willd. The pith of all the water forms was characterised by the presence of tannin cells. Tannin is known to provide protection against microbial growth in water plants (Farkas and Kirlay 1962).

Thus, *Marsilea* L. shows adaptation to a wide range of habitats from aquatic to subterrestrial, terrestrial and xerophytic. Gupta (1962) stated that water is an important ecological factor in bringing about variations in size and shape of vegetative organs, and has probably led to the differentiation in terrestrial

and hydrophytic forms in *Marsilea* L. Allsopp (1963) observed that land and water forms show striking phytochemical differences. Wadhwani (1983) reported that land and water forms of *M. diffusa* Lepr. respond differently to the same cultural regime. Water forms of *Marsilea* L. are reported as more labile to hypothermia than land forms (Joseph 1998).

In this study, all the three species of *Marsilea* L. exhibited significant morphological variations between land and water forms. Evidently, the amount of water available had a great impact on the morphological and anatomical differences in land and water forms.

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